

### ABSTRACT

A method and apparatus for the humidification of gas streams, such as reactant gas streams for fuel cells, wherein the specific water evaporation rate, gas delivery temperature, and degree of gas humidity may be adjusted and maintained at predetermined levels. An ultrasonic device providing a water mist is used in the evaporation process. The amount of water vapor being introduced into the gas stream can be varied up to the saturation point of the reactant gas stream. As the water vapor leaves the evaporation chamber, it mixes with the gas stream in a gas humidification chamber or riser. The humidified reactant gas stream is then maintained at a set point temperature that is at least above the dew point temperature of the humidified reactant gas.